Maxillofacial Trauma Readiness Briefing

Designed to assist local facilities with Dental Readiness Training

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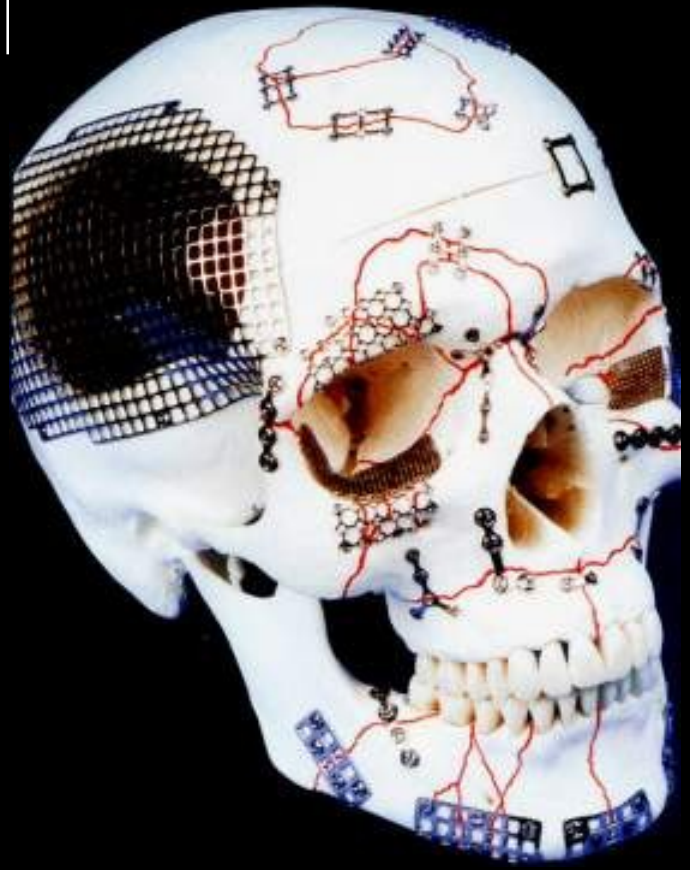
59 MDW OMFS

Maxillofacial Trauma

Readiness Training
for
Dental Officers

Maxillofacial Trauma

Evaluation and



Maxillofacial Injuries

- **Treatment divided into following phases**
  - **Emergency or initial care**
  - **Early care**
  - **Definitive care**
  - **Secondary care or revision**

Emergency Care

- Preserve the airway
- Control of hemorrhage
- Prevent or control shock
- C-Spine stabilization
- Control of life-threatening injuries
  - head injuries, chest injuries, compound limb fractures, intra-abdominal bleeding

Emergency Care

- **Evaluate the airway**
  - **Existence & identification of obstruction**
  - **Manually clear of fractured teeth, blood clots, dentures**
  - **Endotracheal intubation & packing of oronasal airway**

Emergency Care

- **Airway Management**
  - **Maintain an intact airway**
  - **Protect airway in jeopardy**
  - **Provide an airway**
- **C-Spine injury may be present**
- **Altered level of consciousness is the most common cause of upper airway obstruction**

Airway Management

- Chin lift to open intact airway
- Intubation
  - Oral: C-spine injury absent on X ray
  - Nasotracheal intubation: C-spine injury suspected or certain
- Surgical Airway
  - Cricothyroidotomy
  - Tracheosotomy

Emergency Care

- Extensive vascularity of head & neck may lead to massive blood loss
  - Monitor vital signs closely
  - Intravenous infusion
- Penetrating injuries need to be explored
  - Arteriogram
  - Esophagram

Treatment of Blood Loss & Shock

- Hemorrhage most common cause of shock after injury
- Multiple injury patients have hypovolemia
- Goal is to restore organ perfusion

Treatment of Blood Loss & Shock

- External bleeding controlled by direct pressure over bleeding site
- Gain prompt access to vascular system with IV catheters
- Fluid replacement
  - Ringer's Lactate
  - Normal saline
  - Transfusion

Stabilization of associated injuries

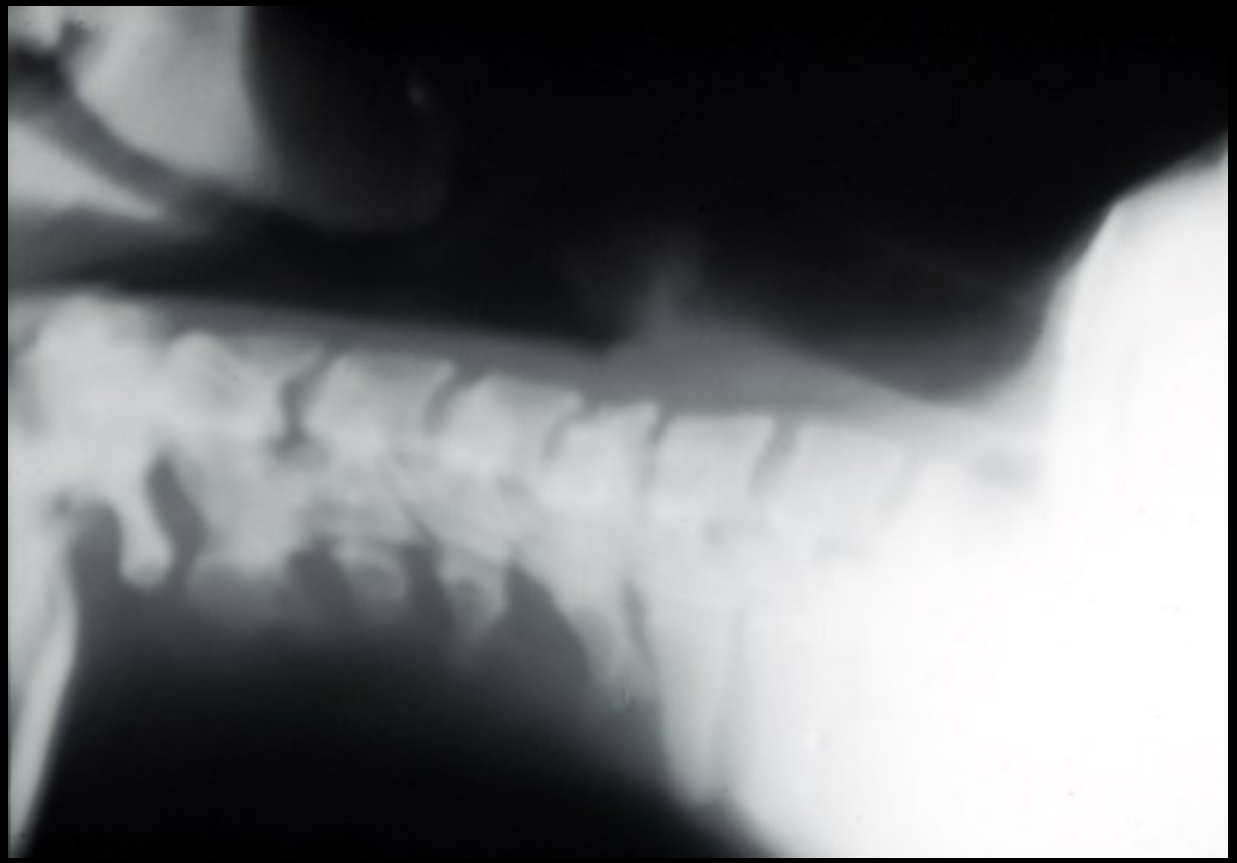
- C-spine injury is primary concern with all maxillofacial trauma victims
  - Any patient with injury above clavicle or head injury resulting in unconscious state
  - Any injury produced by high speed
  - Signs/symptoms of C-Spine injury
    - Neurologic deficit
    - Neck pain

Stabilization of associated injuries

- C-spine injury suspected
  - Avoid any movement of spinal column
  - Establish & maintain proper immobilization until vertebral fractures or spinal cord injuries ruled out
    - Lateral C-spine radiographs
    - CT of C-spine
    - Neurologic exam

Head/Neck/C-Spine Stabilization

Lateral C-Spine Film



C-spine CTs

Early Care

- Emergency care has stabilized patient
- Initial stabilization of fractures
- Debridement & dressing of soft tissues
- Elective tracheostomy
- Physical exam & history
- Laboratory tests
- Complete head & neck examination
  - Diagnosis of maxillofacial injuries

Diagnosis of Maxillofacial Injuries

- Inspection
- Palpation
- Diagnostic Imaging
  - Plain films
  - CT
  - Stereolithography (where available)

Diagnosis of Maxillofacial Injuries

- **INSPECTION**
  - **Hemorrhage**
  - **Otorrhea**
  - **Rhinorrhea**
  - **Contour deformity**
  - **Ecchymosis**
  - **Edema**
  - **Continuity defects**
  - **Malocclusion**

Inspection

Sublingual ecchymosis

Step defects, ridge discontinuity, malocclusio

Diagnosis of Maxillofacial Injuries

- **PALPATION**
  - **"Step" Defect**
  - **Crepitus**
    - **Bony segments**
    - **Subcutaneous emphysema**
    - **Mobility**

Diagnosis of Maxillofacial Injuries

- **DIAGNOSTIC IMAGING**
  - **Panorex**
  - **Plain films**
  - **CT**
  - **Stereolithography**

R

CT Scans

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Speed Adv SYS#HSA2
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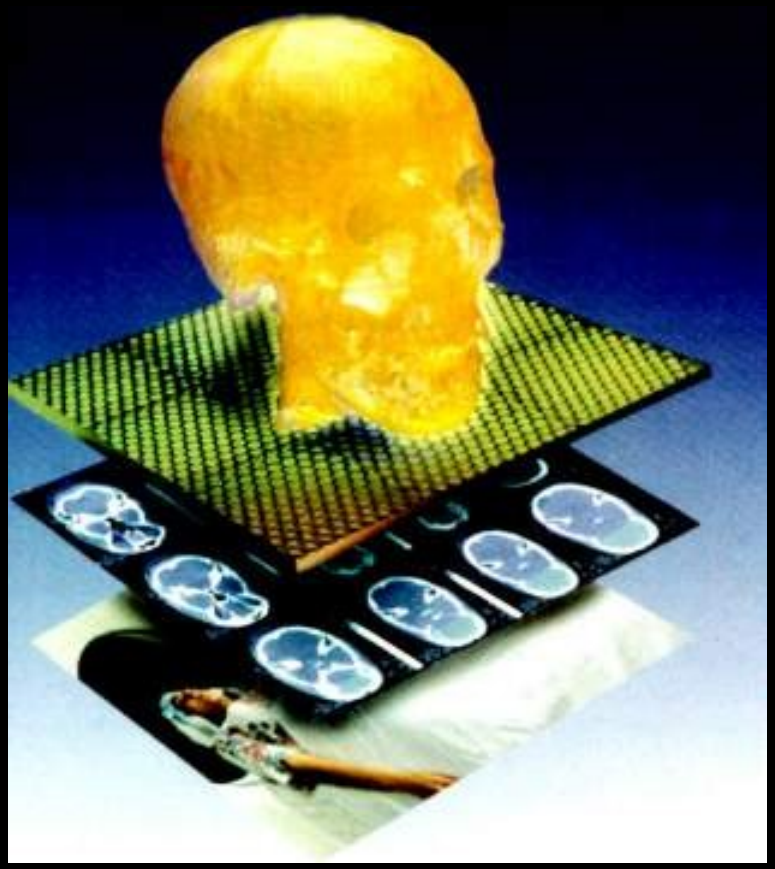
mA 170
Head
RODRIGUE

3D CT

Stereolithography



Definitive Care

- **Soft Tissue Injuries**
  - **Contusions**
  - **Abrasions**
  - **Lacerations**

Soft tissue injury

- **Facial lacerations not complicated by associated injury can be managed in an ER setting**
- **Large extensive facial and scalp lacerations are preferably closed in an operating room environment**

Soft tissue injury

- Hemostasis
- Debridement
- Approximate wound edges
  - Sutures
  - Steristrips
- Dressings
- Antibiotics/Tetanus

Facial lacerations

Associated Soft Tissue Injury

- Lacrimal System
- Parotid Duct
- Facial Nerve
  - Surgical repair if posterior to vertical line drawn from outer canthus of eye

Associated Soft Tissue Injury

Remember to think in 3D for there are always other structures involved!

Mandibular Fractures

- **Mandible is second most common fractured facial bone**
- **50% of mandibular fractures are multiple**
  - **Examine patient and radiographs closely and suspect additional fractures**

Mandibular Fractures

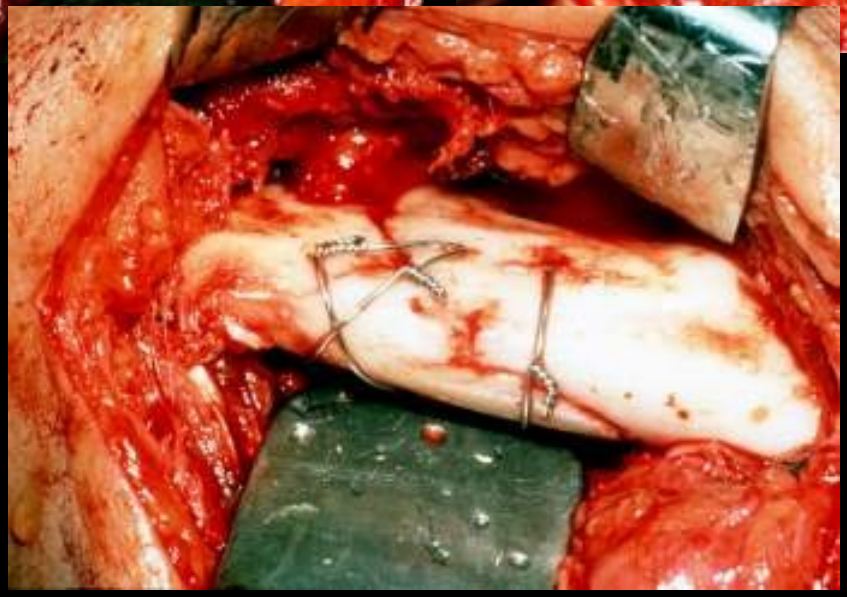
- **Clinical Signs and Symptoms**
  - **Tenderness & pain**
  - **Malocclusion**
  - **Ecchymosis in floor of mouth**
  - **Mucosal lacerations**
  - **Step defects inferior border**
  - **CN V_3 Disturbances**

Mandibular Fractures

- Treatment depends on fracture site and amount of segment displacement
- Closed reduction
  - Application of arch bars
  - Placement into intermaxillary fixation (IMF)
- Open Reduction
  - Internal wire fixation
  - Bone plates

Closed Reduction with IMF

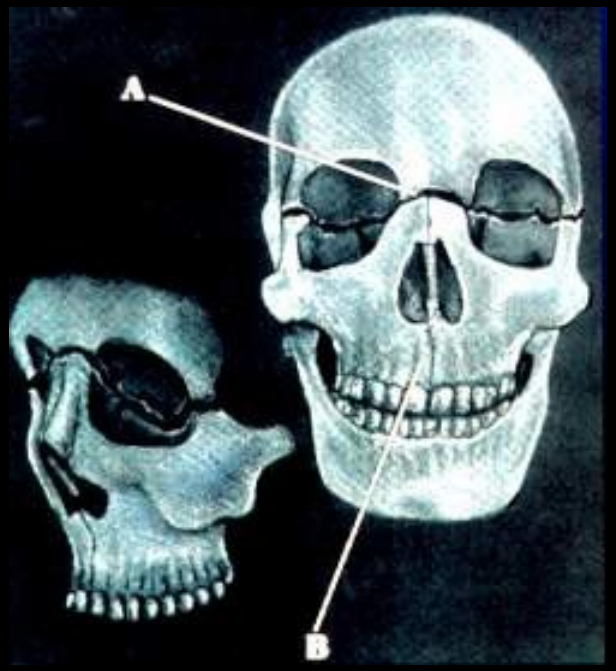
Open Reduction



Open Reduction

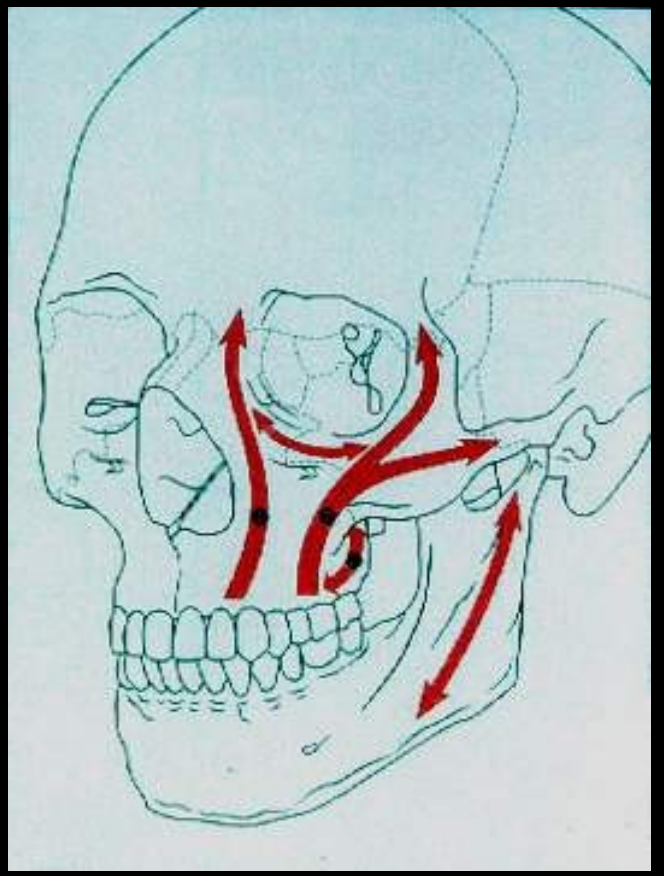
Midface Fractures

- LeFort I Transverse Maxillary
- Lefort II Pyramidal
- Lefort III Craniofacial Dysjunction
- Zygomatic Complex
- Orbital Floor
- Nasal Fractures
- Naso-orbital/Ethmoid



Midface Fractures

- **Three buttresses allow face to absorb force**
  - **Nasomaxillary (medial) buttress**
  - **Zymaticomaxillary (lateral) buttress**
  - **Pyterigomaxillary (posterior) buttress**



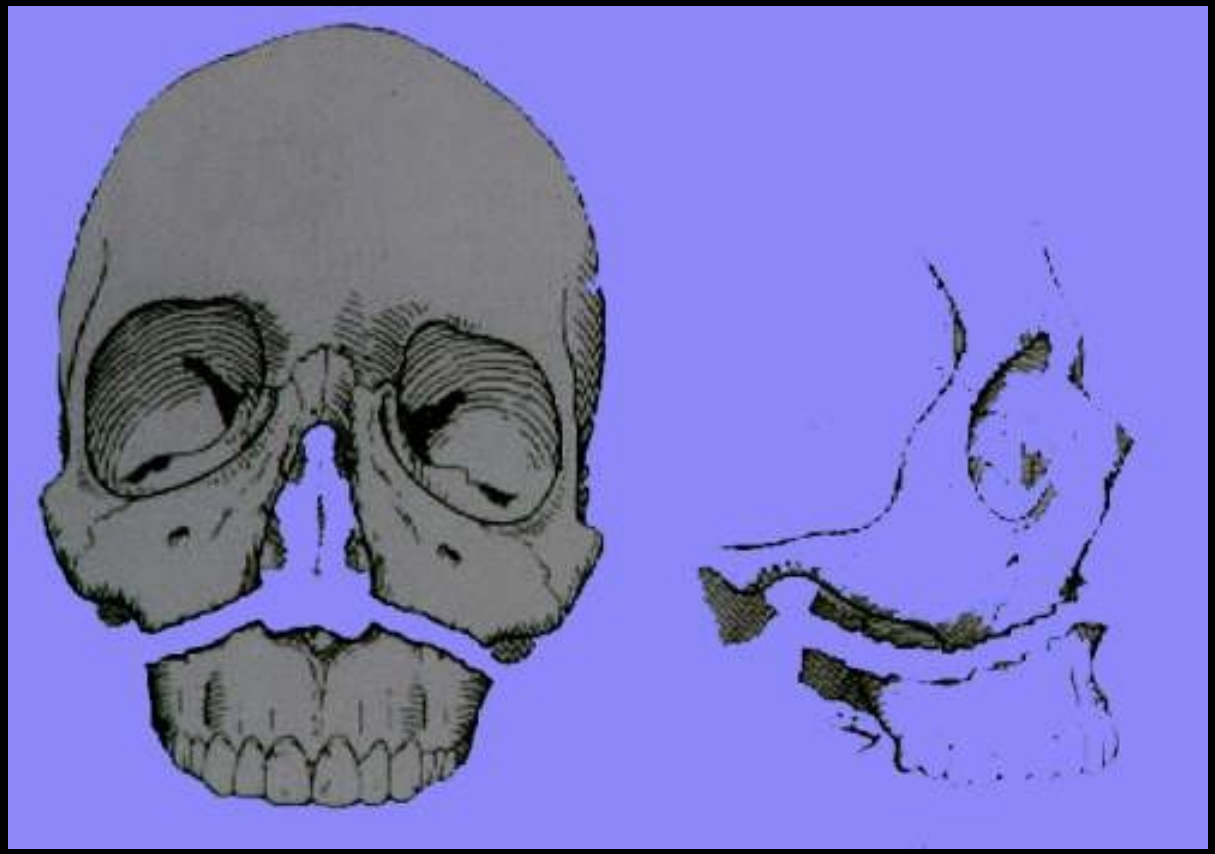
Lefort Classification

- **Weakest areas of midfacial complex when assaulted from a frontal direction at different levels (Rene' Lefort, 1901)**
  - **Lefort I: above the level of teeth**
  - **Lefort II: at level of nasal bones**
  - **Lefort III: at orbital level**

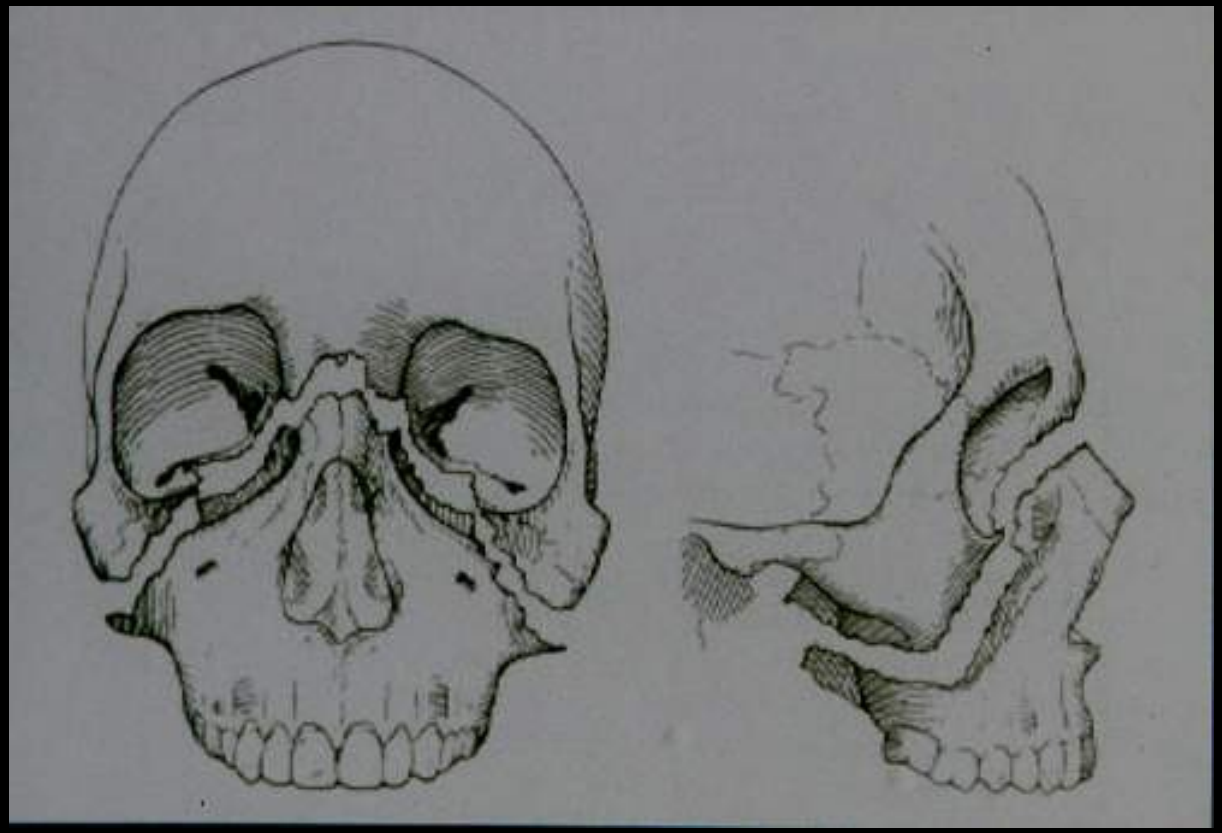
Lefort Classification

- Provides uniform method to describe the level of major fracture lines
- Allows references regarding the probable points of stability for surgical treatment
- Does not incorporate vertical or segmental fractures, comminution or bone loss

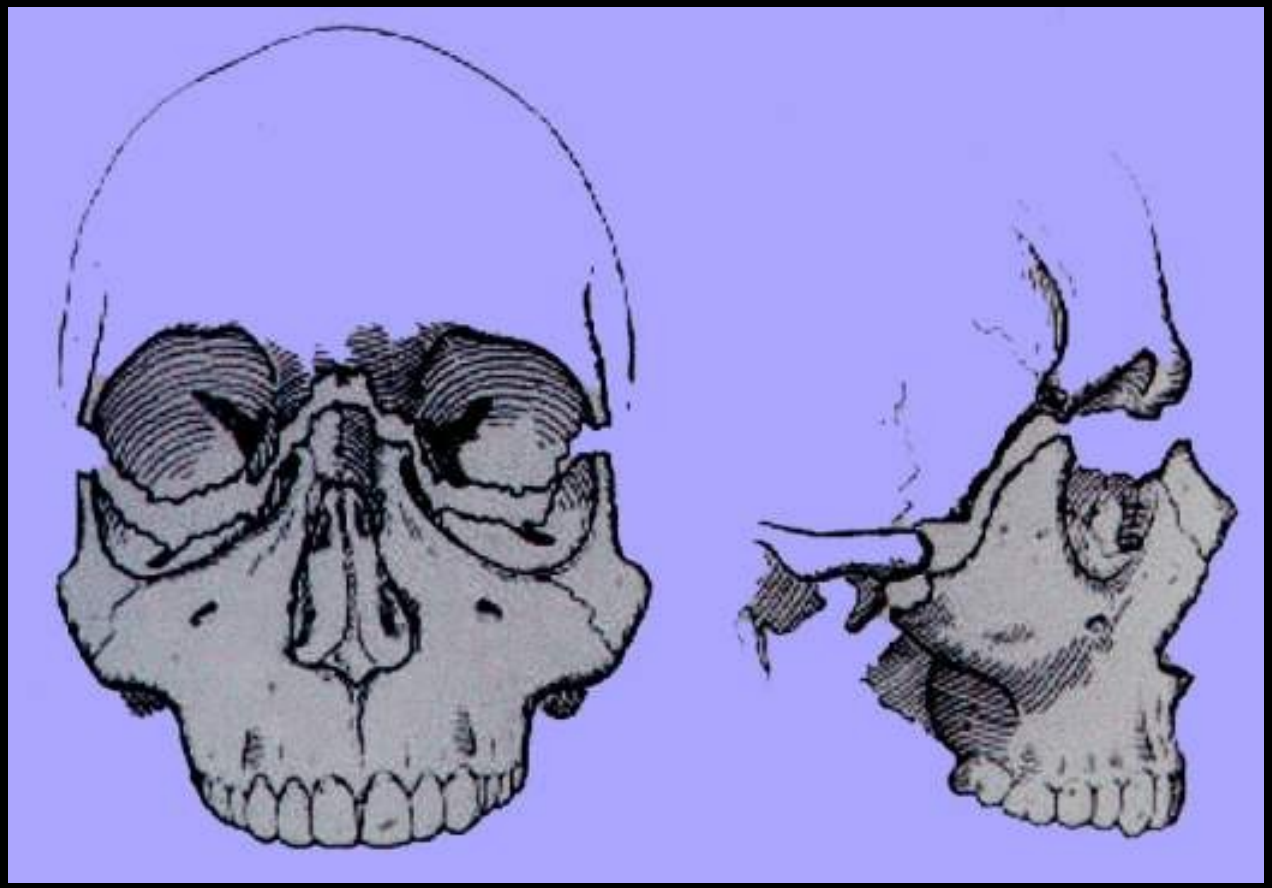
Lefort I Fracture
Transverse Maxillary



Lefort II Fracture
Pyramidal



Lefort III Fracture
Craniofacial Dysjunction



Facial Examination

- Evaluate for laceration
- Obvious depression in skull
- Asymmetry
- Discharge from nose or ear
  - Assume CSF leak
- Palpation to note bone discontinuity
  - Bimanually in systematic manner

Facial Examination

- Evaluate mandibular opening
- Palpation of buccal vestibule
  - Crepitus of lateral antral wall
- Occlusion evaluated
  - Absence and quality of dentition noted
- Ecchymosis common finding
- Pharynx evaluated for laceration & bleeding

Facial Examination

- **Orbits evaluated**
  - **Periorbital edema and ecchymosis**
  - **Gross visual acuity determined**
  - **Diplopia**
  - **Pupillary size & shape**
  - **Subconjunctival hemorrhage**
  - **Funduscopic evaluation**

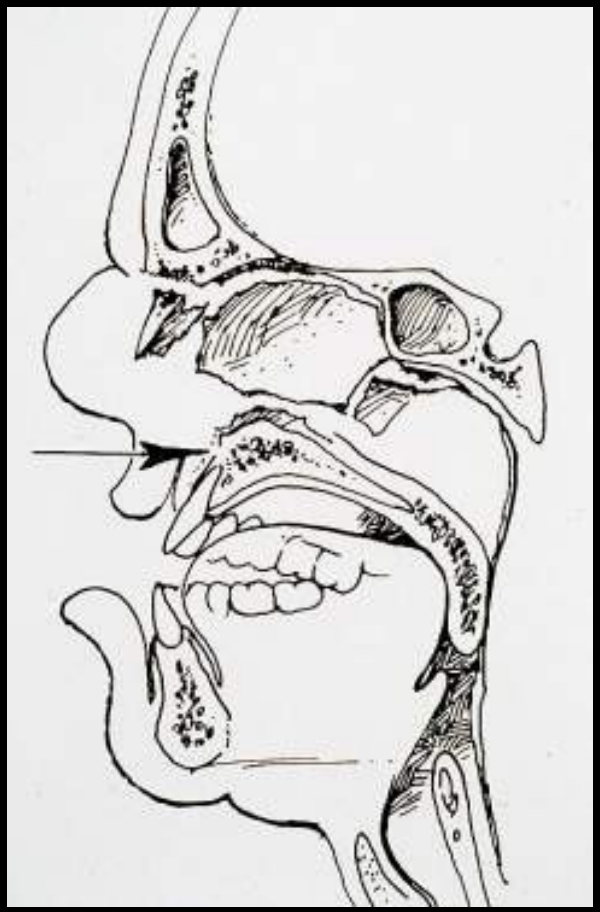
Facial Examination

- Orbits evaluated
  - Lid lacerations
  - Attachment of medial canthal tendon
    - Rounding of lacrimal lake
    - Increased intercanthal distance
    - Epiphora
  - Prompt Ophthamology consult

Facial Examination
Orbits Evaluated

Facial Examination

Palpation of Midface/bridge of nose



Radiographic Evaluation

- **Plain Films**
  - **Lateral Skull**
  - **Waters View**
  - **Posteroanterior view of skull**
  - **Submental vertex**
- **CT Scan**
  - **1.5 mm cuts**
  - **axial and coronal views**

Radiographic Evaluation

Lateral skull

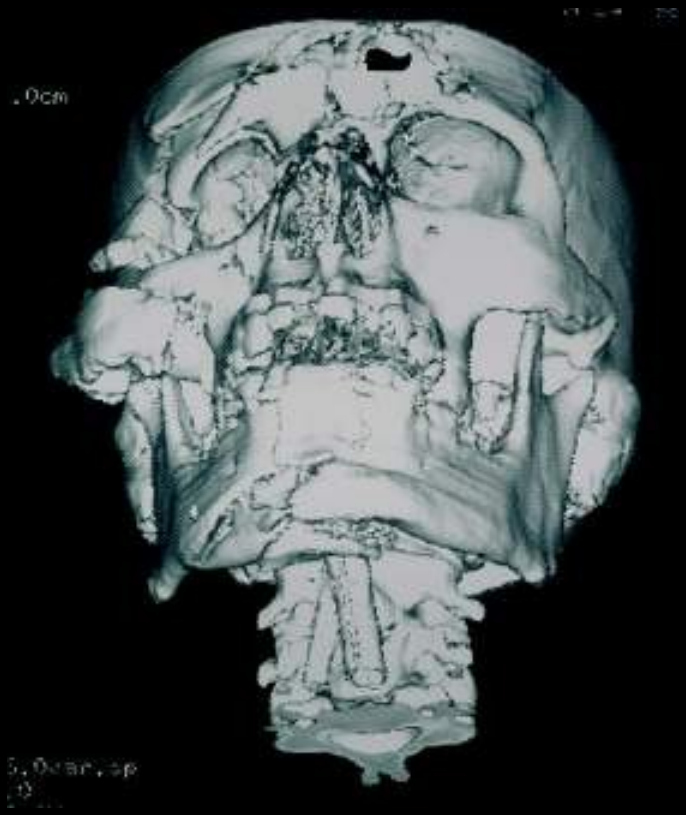
Water’s View

Radiographic Evaluation

CT Scan

3D CT

Radiographic Evaluation



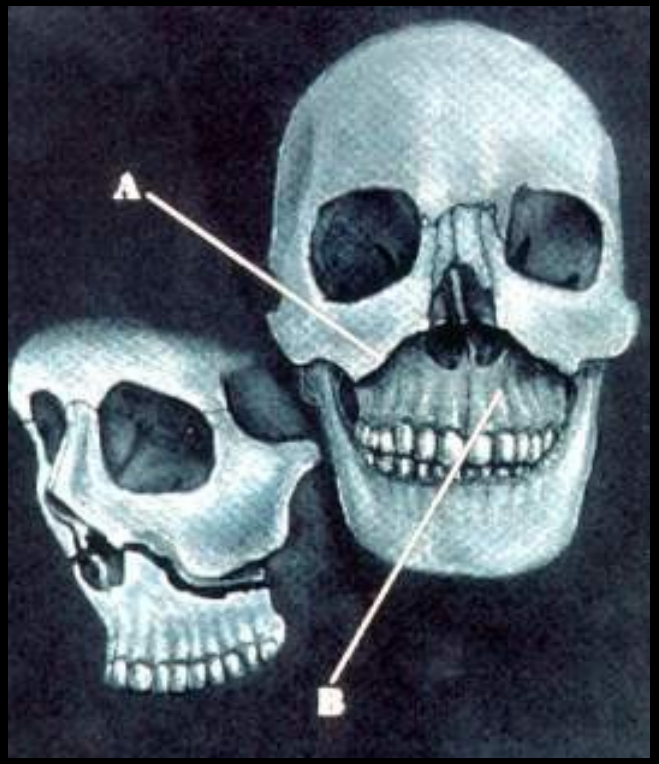
Stereolithography allows actual model of defect. A nice reconstruction tool to use if available

Treatment of Midface Fractures

- **Once patient's condition stabilized, no need to rush to surgery**
  - **Address rapidly developing edema**
  - **Formulate treatment plan**
  - **Observe sequelae in the case of orbital injuries**

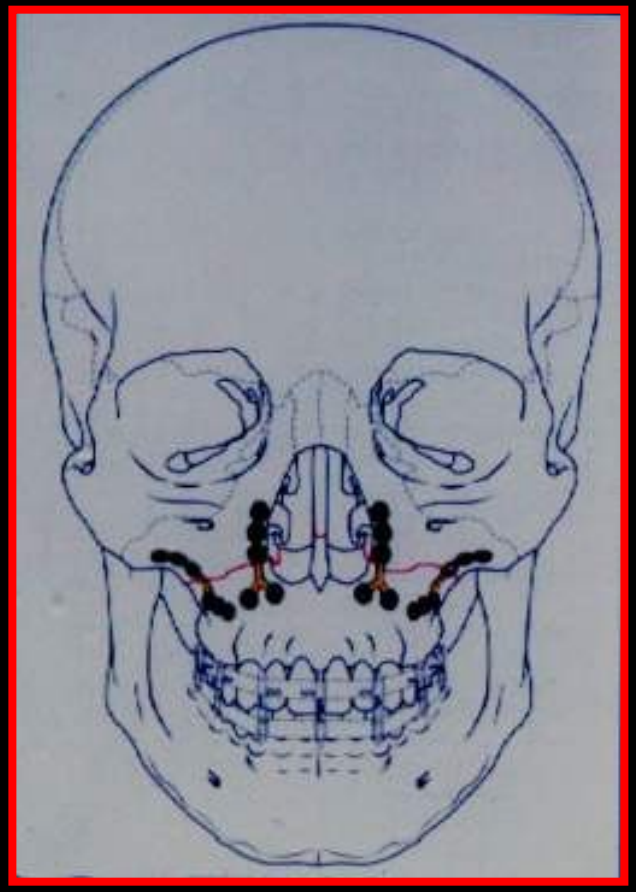
Diagnosis of Lefort I Fractures

- Direction of force
- Maxilla displaced posteriorly and inferiorly
  - Open bite deformity
- Hypoesthesia of infraorbital nerve
- Malocclusion
- Mobility of maxilla
  - Noted by grasping maxillary incisors



Treatment of Lefort I Fractures

- Direct exposure of all involved fractures
- Reduction and anatomic realignment of the maxillary buttresses to reestablish
  - Anterior projection
  - Transverse width
  - Occlusion
- Restoration of occlusion using IMF
- Internal fixation using miniplate fixation



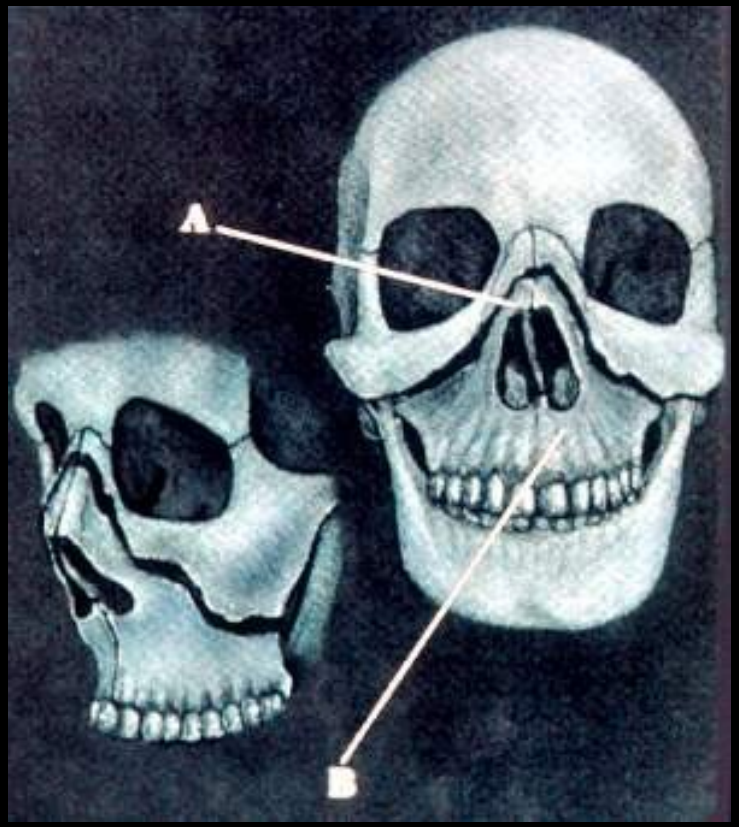
Treatment of Lefort I Fractures

Diagnosis of Lefort II and III

- Clinical evaluation provides only a rough impression since swelling hides the underlying bony structures
- Plain film radiographs and axial and coronal CT images are the basis for precise diagnosis & treatment plan

Diagnosis Lefort II and III

- **Bilateral periorbital edema & ecchymosis**
- **Step deformity palpated infraorbital & nasofrontal area**
- **CSF rhinorrhea**
- **Epistaxis**



Treatment of Lefort II and III

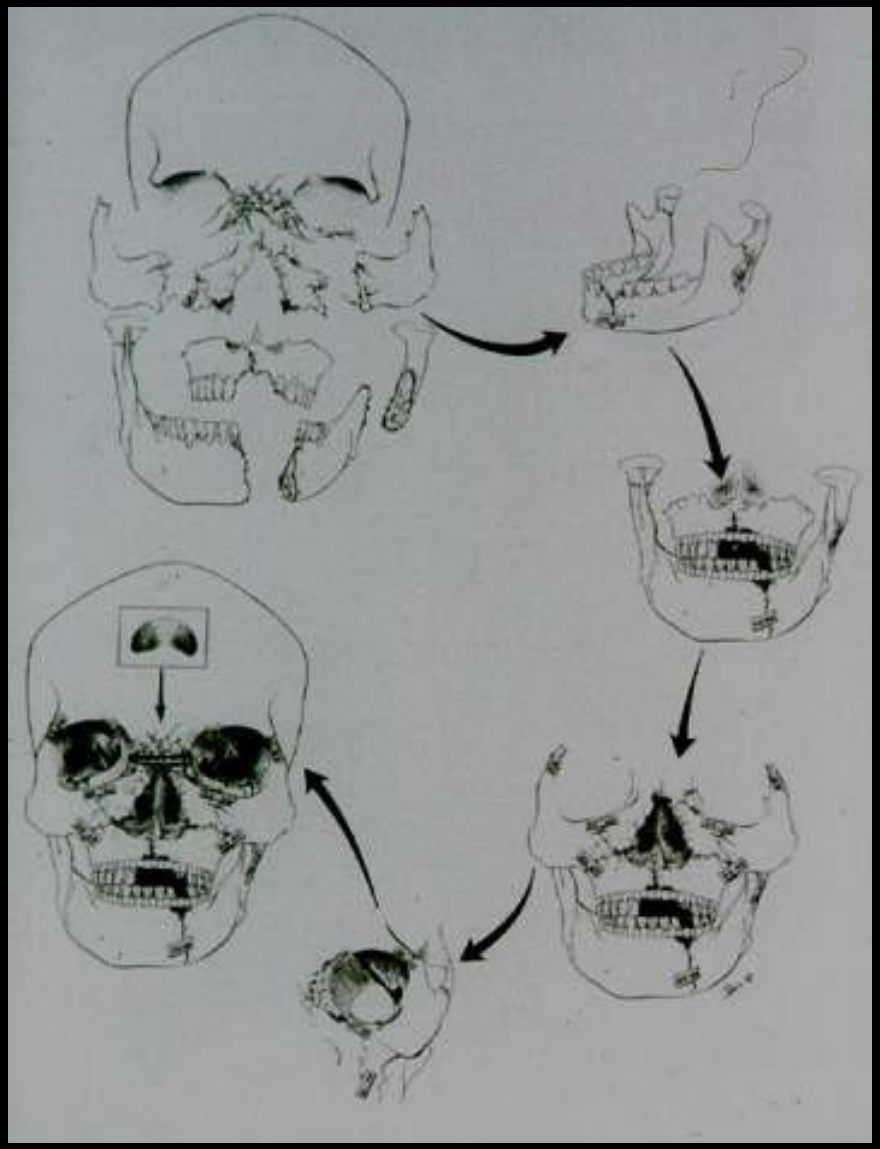
- Fractures should be treated as early as the general condition of the patient allows
- Team approach to treatment
  - Neurosurgery
  - Ophthamology
  - ENT
  - Plastic surgery
  - Oral/Maxillofacial surgery

Treatment of Lefort II and III

- Intubation must not interfere with ability to use IMF
- Exposure & visualization of all fractures
  - Approaches to inferior rim
    - Infraorbital
    - Subciliary
    - Transconjunctival
    - Mid lower lid
  - Coronal approach
  - Gingivobuccal incision

Fractures

Teeth and occlusion are the key to reconstruction and provide the foundation upon which other facial structures are built



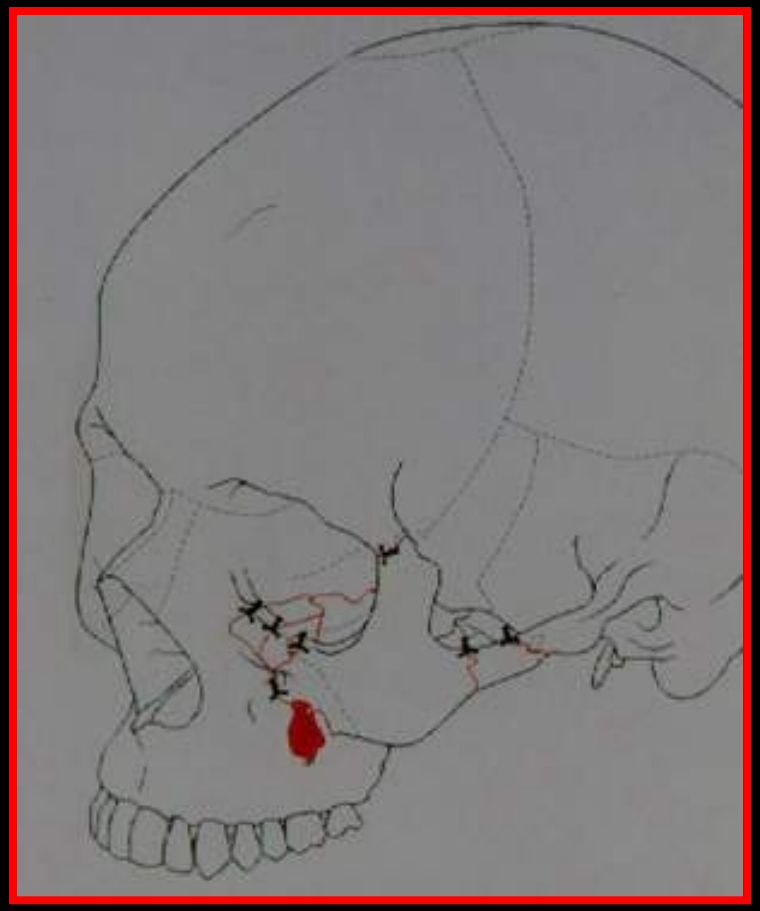
Treatment of Lefort II and III

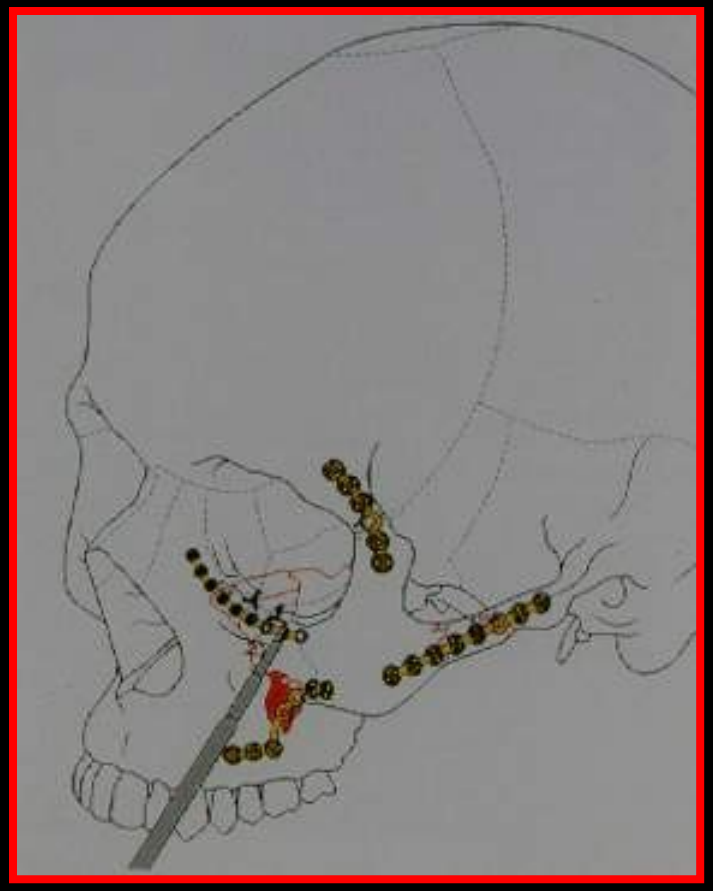
- Severely comminuted fractures preliminary approximation may be performed with wire
- Establishment of the correct occlusion
- Correct reconstruction of the outer facial frame for proper facial dimensions
- Correct position for nasoethmoidal complex

Treatment of Lefort II and III

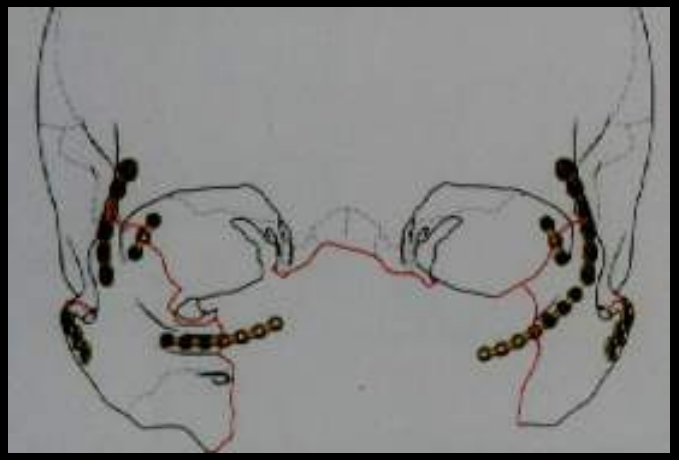
- Reestablishment of the correct intercanthal distance
- Infraorbital rim fixated
- Orbit is reconstructed
- Occlusion unit with IMF is fixated

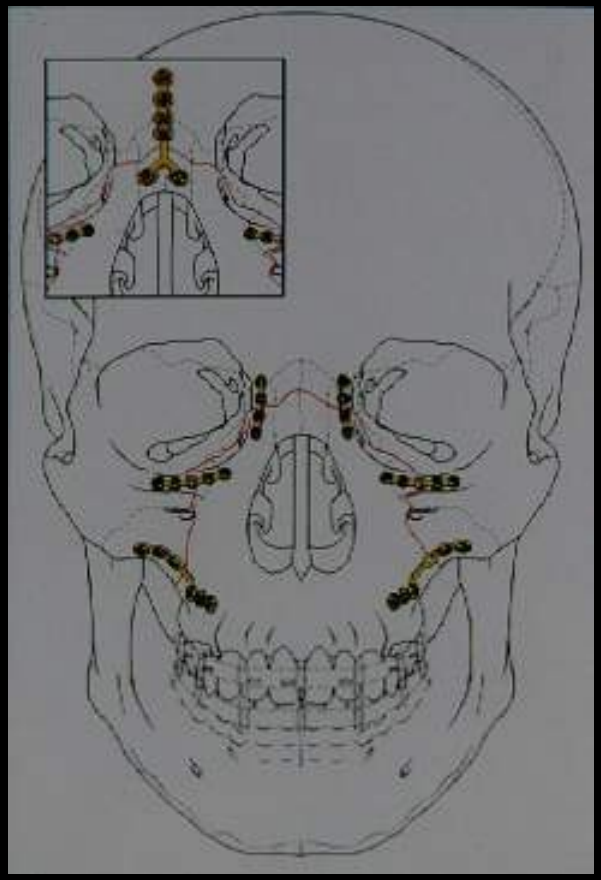
Lefort II & III Reconstruction

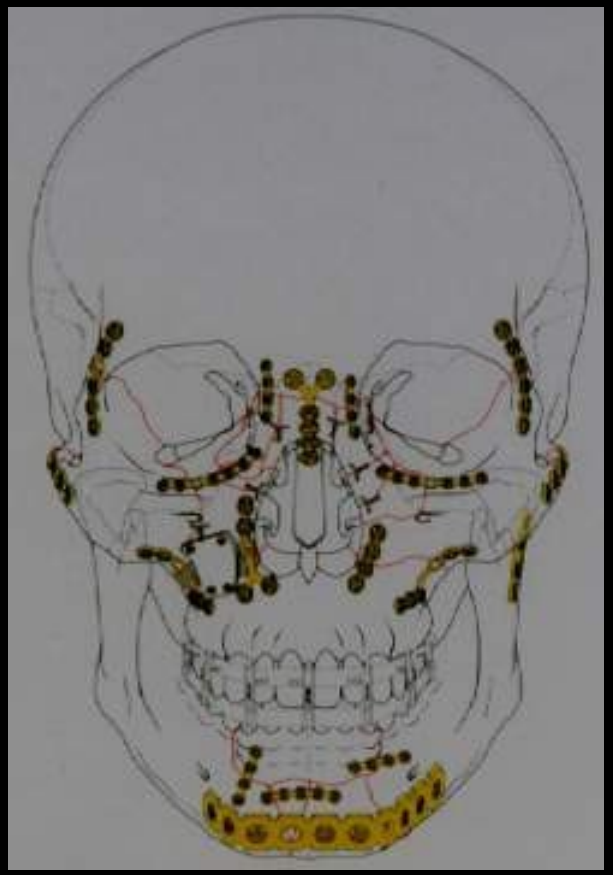




Lefort II & III Reconstruction

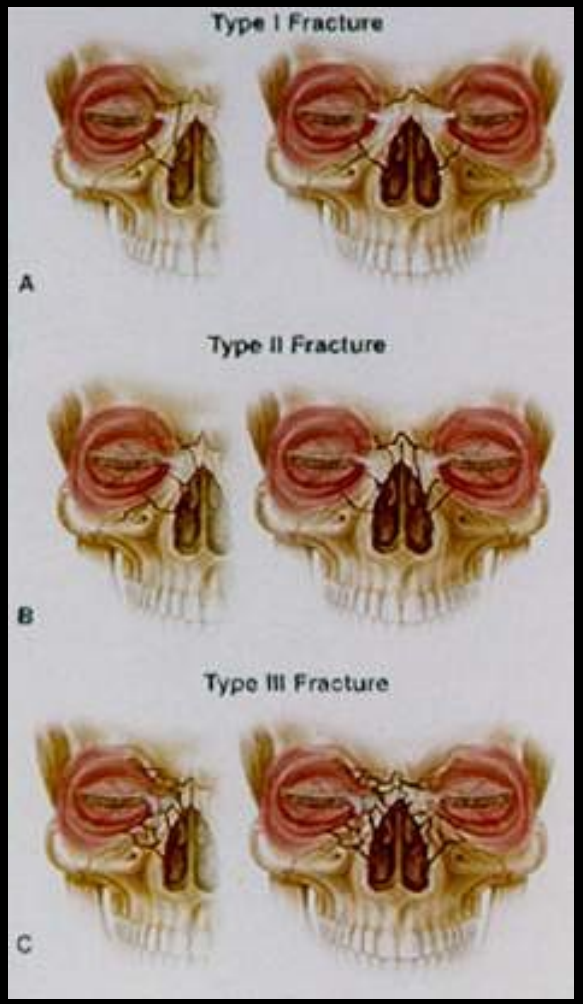






Nasal-Orbital-Ethmoid (NOE) Fractures

- Usually not isolated event
- Frequently associated with multiple midface fractures
- Secondary to traumatic insult to radix area of nose
- Low resistance to directional force
  - 35-80 gm necessary to produce fracture



Nasal-Orbital-Ethmoid Fractures

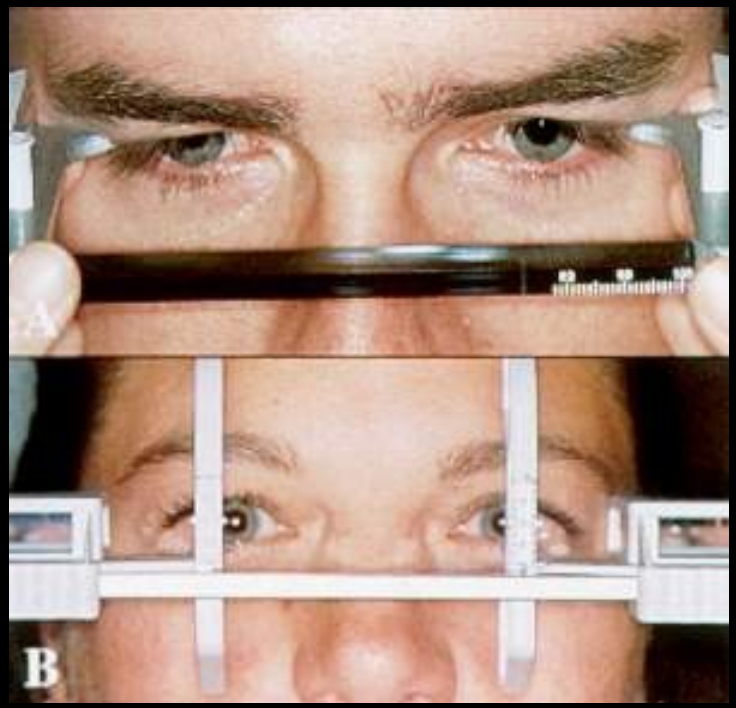
- Diagnosis
  - Ophthalmalogic evaluation
    - Document visual acuity
    - Pupillary response to light
  - Neurologic evaluation
    - Frontal lobe contusion
    - Glasgow coma scale
      - Increase in ICP and need for monitoring

Nasal-Orbital-Ethmoid Fractures

- **Nasal fracture**
  - **Comminuted with posterior displacement**
  - **Widened nasal bridge**
  - **Splaying of nasal complex**
- **Epistaxis**
- **Severe periorbital edema & ecchymosis**
- **Subconjunctival hemorrhage**

Nasal-Orbital-Ethmoid Fractures

- Clinical signs & symptoms
  - Traumatic telecanthus
    - Difficult to measure due to edema
      - Average 33-34 mm
    - Can measure interpupillary distance and divide in half for approximate intercanthal distance
      - Average 60-65 mm
  - Damage to lacrimal apparatus-epiphora
  - CSF leak



Nasal-Orbital-Ethmoid Fractures

- Radiographic examination
  - CT - definitive imaging modality
    - Axial images supplemented with coronal
    - Plain films to fail demonstrate the degree and location of fractures secondary to over-lapping of bony archi- tecture

Nasal-Orbital-Ethmoid Fractures

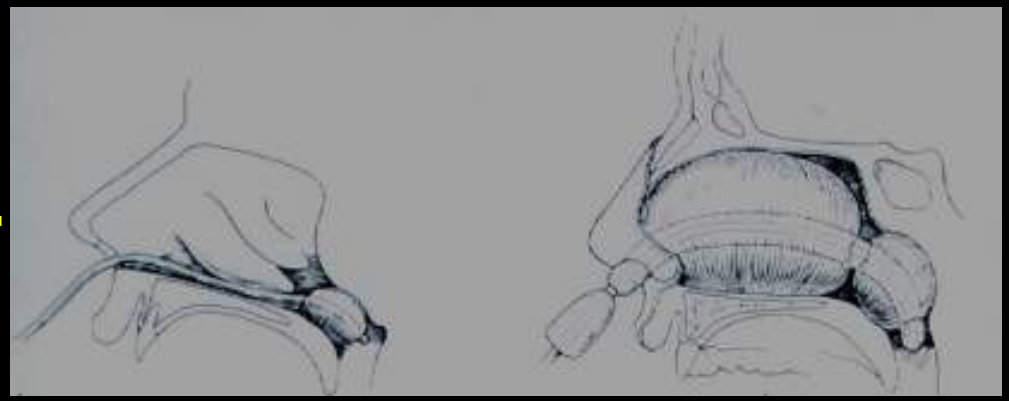
CT Scans

Nasal Fractures

- Depression or angulation
- Periorbital ecchymosis
- Epistaxis
- Tenderness
- Crepitus
- Septal deviation
- Septal hematoma

Nasal Hemorrhage

- Nasal packing
- Merocel sponge
- Nasopharyngeal balloon
  - Epistat
  - Foley catheter



Nasal-Orbital-Ethmoid Fractures

- **Nasal fractures**
  - **Rule out septal hematoma**
  - **Remove clots with suction, incise and drain if present to prevent septal necrosis**
  - **Closed reduction for simple fractures**
  - **Open reduction for severely displaced fractures**

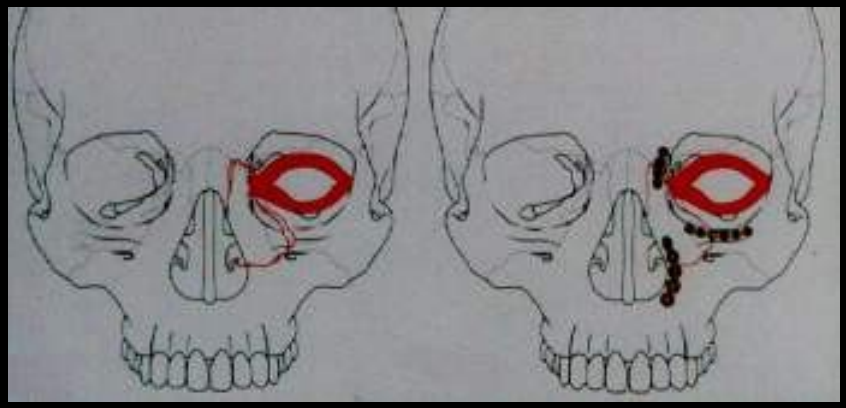
Nasal-Orbital-Ethmoid Fractures

Nasal Fractures

- **Treatment**
  - **Restoration of form and function**
  - **Proper reduction of nasal fractures**
  - **Correction of medial canthal ligament disruption**
  - **Correction of lacrimal system injuries**

Nasal-Orbital-Ethmoid Fractures

- **Surgical considerations**
  - **Definitive surgery as soon as possible after:**
    - **Appropriate consultations**
    - **Definitive radiographic imaging**
    - **Significant edema allowed to resolve**



Nasal-Orbital-Ethmoid Fractures

- **Surgical considerations**
  - **The final phase involves reduction of the NOE and nasal bone fractures**
  - **Access to NOE through existing lacerations, bicoronal flap, or local incisions**

Nasal-Orbital-Ethmoid Fractures

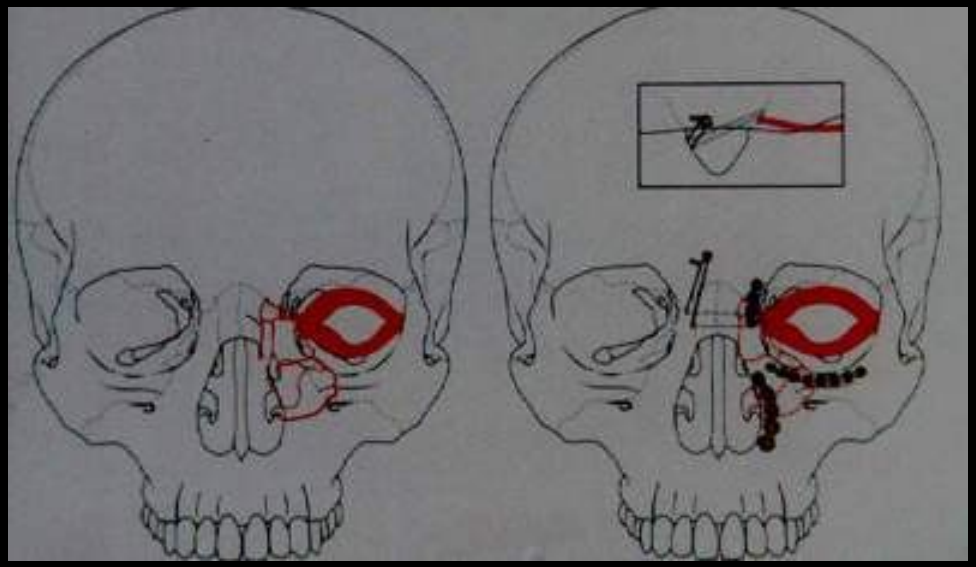
- **Lacrimal system injury**
  - **When the medial canthal ligament has been injured or displaced, damage to the lacrimal system should be assumed**
  - **Nasolacrimal duct is often damaged within its bony course**
  - **Epiphora: Need to evaluate patency of the nasolacrimal system**

Nasal-Orbital-Ethmoid Fractures

Surgical Reduction

Nasal-Orbital-Ethmoid Fractures

Surgical Reduction



Gunshot wound management

- Advanced trauma life support
  - Primary survey
    - ABC's
    - C-Spine stabilization
    - Neurological assessment
  - Secondary survey
    - Determine extent of injury
  - Definitive treatment

Animal Bites

- Hemostasis
- Debridement
- Approximate wound edges
- Dressings
- Antibiotics/Tetanus
  - Augmentin

Acknowledgements

- DIS would like to thank Lt Col Jeff Armstrong for his expertise in providing this briefing for local facilities
- For any questions concerning this presentation, please contact DIS at DSN 792-7676